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Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method for controlling a gap between ~~in an~~ electrically conducting features on a membrane ~~solid state structure~~, comprising the steps of:

providing a plurality of electrically conducting features disposed on a membrane including an aperture aligned with a gap between the features;

exposing the features to a fabrication process environment conditions of which are selected to alter an extent of the gap ;

applying a voltage bias across the gap during process environment exposure of the features;

measuring electron tunneling current across the gap during process environment exposure of the features to indicate an extent of the gap; and

controlling the process environment during process environment exposure of the features, based on the tunneling current measurement, to control an extent of the gap.

2. Canceled.

3. (Original) The method of claim 1 wherein controlling the process environment comprises comparing tunneling current measurement with a threshold tunneling current corresponding to a prespecified gap extent and controlling the process environment based on the comparison.

4. (Previously Presented) The method of claim 1 wherein the conditions of the fabrication process environment are selected to increase an extent of the gap.

5. (Previously Presented) The method of claim 1 wherein the conditions of the fabrication process environment are selected to decrease an extent of the gap.

6. (Previously Presented) The method of claim 1 wherein the fabrication process environment comprises ion beam exposure of the features.

7. (Previously Presented) The method of claim 6 wherein the ion beam exposure comprises blanket ion beam exposure of the features.

8. (Currently Amended) The method of claim 6 wherein the ion beam exposure comprises rastering of the features ~~structure~~ by a focused ion beam.

9. (Previously Presented) The method of claim 1 wherein the plurality of electrically conducting features on the membrane comprises two electrically conducting electrodes having the gap between the electrodes.

10. (Currently Amended) The method of claim 9 wherein the membrane comprises ~~electrically conducting electrodes are disposed on~~ an electrically insulating membrane including an aperture aligned with the gap between the electrodes.

11. Canceled.

12. (Canceled)
13. (Canceled)
14. (Canceled)
15. (Canceled)
16. (Canceled)
17. (Canceled)
18. (Canceled)
19. (Canceled)
20. (Canceled)
21. (Canceled)

22. (Previously Presented) The method of claim 1 wherein the fabrication process environment comprises electron beam exposure of the features.

23. (Previously Presented) The method of claim 9 wherein each electrically conducting electrode is connected in a closed-loop circuit across the gap for measuring electron tunneling across the gap.

24. (Previously Presented) The method of claim 9 wherein each electrically conducting electrode is disposed in a connection to an electrical contact pad.

25. (Currently Amended) The method of claim 24 wherein applying a voltage bias across the gap between the electrodes ~~in the structure~~ comprises applying a voltage bias between the electrical contact pads.

26. (Previously Presented) The method of claim 1 wherein providing a plurality of electrically conducting features disposed on a membrane including an aperture aligned with a gap between the features comprises:

first providing an electrically conducting feature, disposed on a membrane including an aperture, without a gap; and

initiating the fabrication process environment to define the plurality of electrically conducting features by forming a gap between the features in alignment with the aperture.

27. (Previously Presented) The method of claim 1 wherein providing a plurality of electrically conducting features disposed on a membrane including an aperture aligned with a gap between the features comprises:

first providing an electrically conducting feature, disposed on a membrane including an aperture, without a gap; and

initiating a fabrication process environment to provide a gap in the electrically conducting feature, in alignment with the aperture, that defines two electrically conducting electrodes separated from each other by the gap.

28. (Currently Amended) The method of claim 27 wherein the exposure of the two electrically conducting electrodes ~~structure~~ to fabrication process environment increases the extent of the gap between the two electrically conducting electrodes.

29. (Previously Presented) The method of claim 10 wherein the electrically insulating membrane comprises a silicon nitride membrane.

30. (Previously Presented) The method of claim 1wherein the membrane is supported at its edges by a silicon substrate.

31. (Previously Presented) The method of claim 1 wherein measuring electron tunneling current comprises amplifying acquired electron tunneling current prior to measuring electron tunneling current.

32. (Previously Presented) The method of claim 1 wherein measuring electron tunneling current comprises digitizing acquired electron tunneling current prior to measuring electron tunneling current.

33. (Previously Presented) The method of claim 1 wherein applying a voltage bias across the gap comprises applying across the gap a voltage that is less than a work function that is characteristic of the electrically conducting features .

34. (Previously Presented) The method of claim 1 wherein controlling the process environment based on tunneling current measurement comprises:

determining an extent of the gap, g, as a function of measured tunneling current, I, and applied voltage bias, V, as:

$$I(V) = aV^2 e^{-b/V}$$

where $a = \dfrac{\sigma e^3}{16\pi^2 \phi \hbar g^2}$ and $b = \dfrac{4(2m_e)^{1/2} \phi^{3/2} g}{3\hbar e}$

and where σ is an area of each electrically conducting feature at opposite sides of the gap, e is the elementary charge, 1.6 x 10^{-19} C; $\hbar$ = 1.1 x 10^{-34} J·s; m_e = 9.1 x 10-

31 Kg; and ϕ is a work function of the electrically conducting features at the gap; and

controlling the process environment based on the determined gap.

35. (Previously Presented) The method of claim 1 wherein controlling the process environment based on tunneling current measurement comprises:

determining an extent of the gap, g, as a function of measured tunneling current, I, and applied voltage bias, V, as:

$$I(V) = I_0 e^{-\alpha\sqrt{\phi}g}$$

where $$I_0 = \frac{\sigma e^2}{4\pi^2\hbar^2}\frac{\sqrt{2m_e\phi}}{g}V$$ and $$\alpha = \frac{2\sqrt{2m_e}}{\hbar}$$

and where σ is an area of each electrically conducting feature at opposite sides of the gap, e is the elementary charge, 1.6×10^{-19} C; $\hbar = 1.1 \times 10^{-34}$ J·s; $m_e = 9.1 \times 10^{-31}$ Kg; and ϕ is a work function of the electrically conducting features at the gap; and

controlling the process environment based on the determined gap.